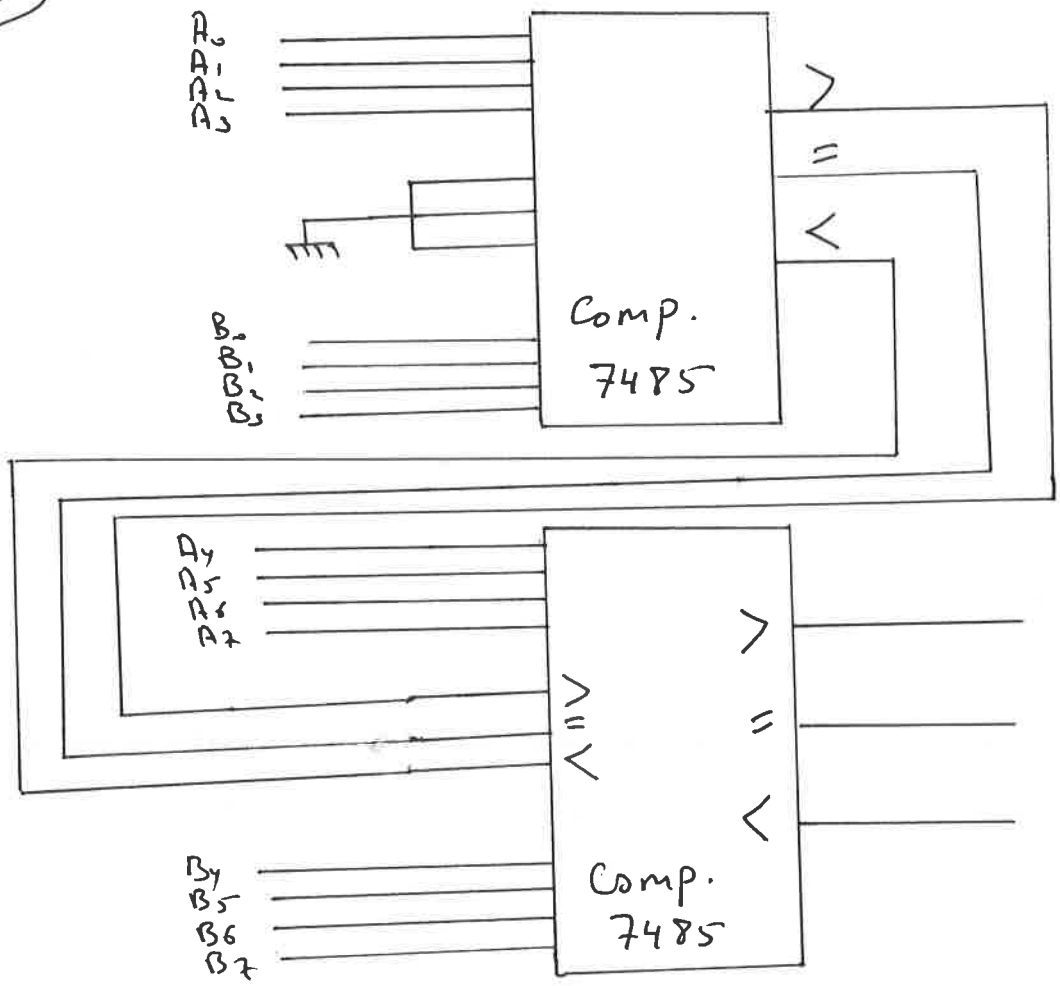
Ex) Use the I.C (7485) Comparator to compare the magnitude of two binary number having 8-bit by means of using it Pin Configration ?.

Sol^n)



In order to build a Logic cct for a comparator to compare 2-binary numbers having (4-bits), we begin with the MSB then the LSB.

- we use (Ex-NOR) for (equal)

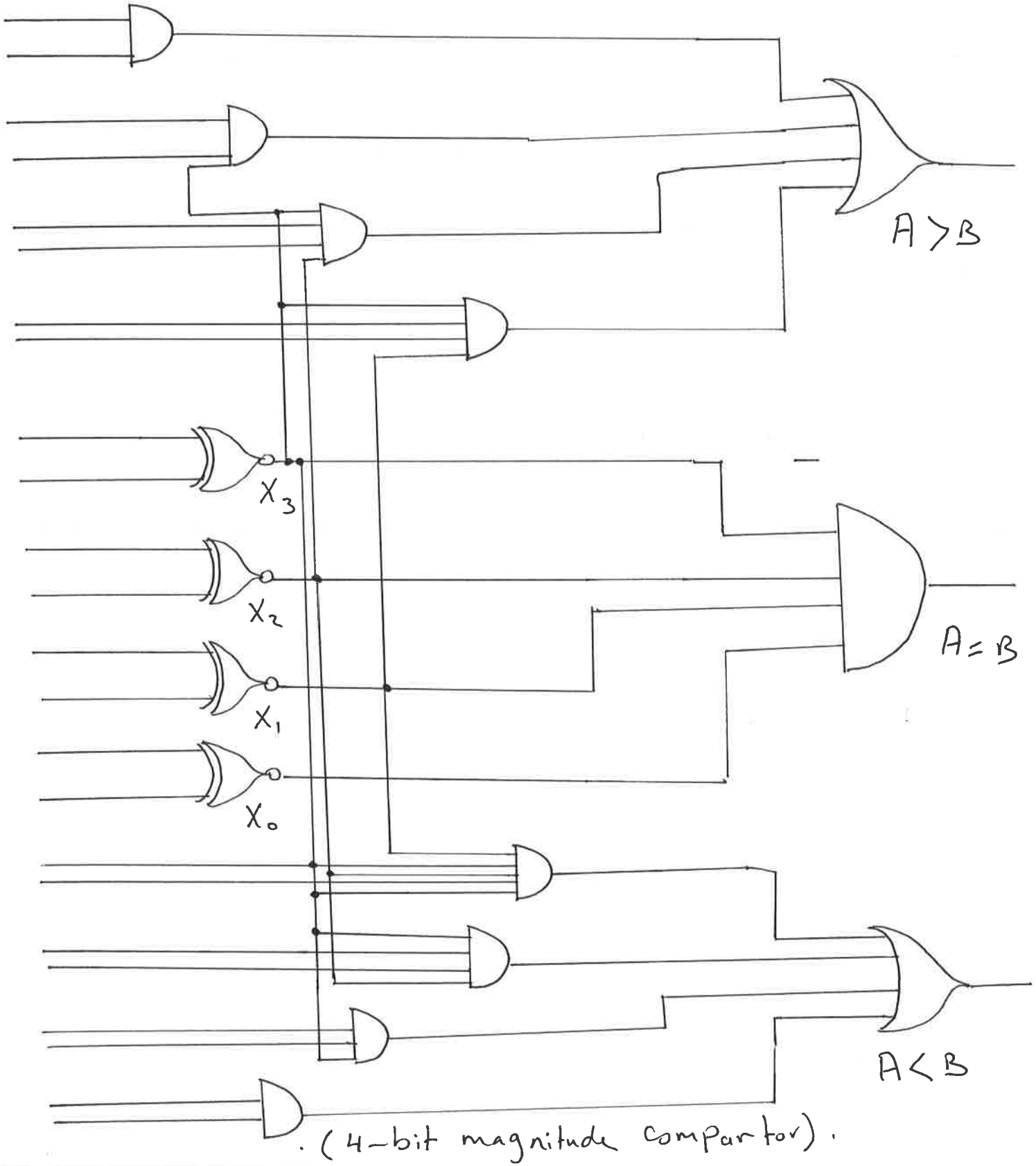
$$X_i = AB + \bar{A}\bar{B} \qquad (i = 0, 1, 2, \ldots, n)$$

where i is the number of bits.

$$A = \overset{MSB}{A_3} A_2 A_1 \overset{LSB}{A_0}$$
$$B = B_3 B_2 B_1 B_0$$

$$A > B \Rightarrow A_3\bar{B_3} + X_3A_2\bar{B_2} + X_3X_2A_1\bar{B_1} + X_3X_2X_1A_0\bar{B_0}$$

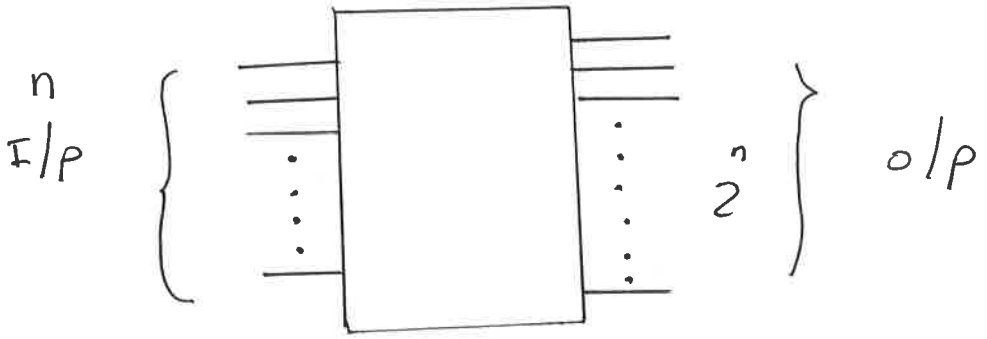
$$A < B \Rightarrow \bar{A_3}B_3 + X_3\bar{A_2}B_2 + X_3X_2\bar{A_1}B_1 + X_3X_2X_1\bar{A_0}B_0$$



. (4-bit magnitude comparator).

DECODER :-

It is a combinational circuit that converts binary Information from I/p lines to a maximum of 2^n unique lines.



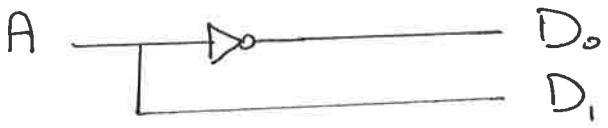
No. of I/P line = n

No. of o/p line = 2^n (I/P, o/p)

Ex) Design a (1-2) Decoder ?

Sol^)

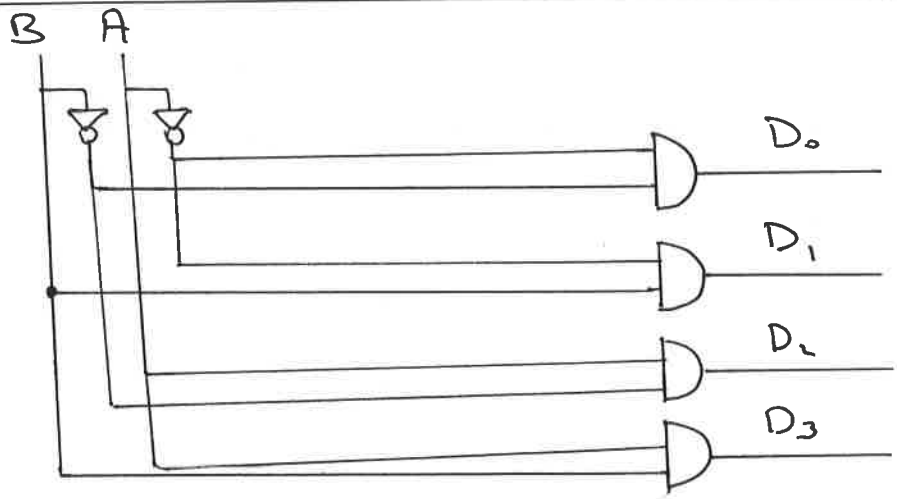
A	D_0	D_1
0	1	0
1	0	1



Ex) Design a (2-4) Decoder ?

Sol^)

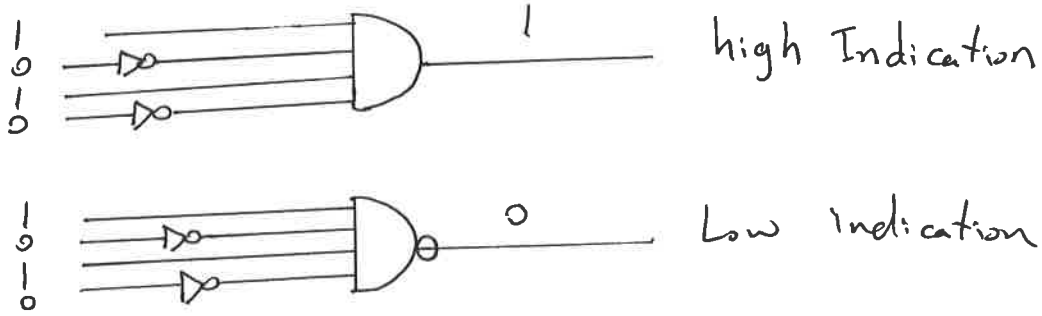
A	B	D_0	D_1	D_2	D_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1



The Binary decoder we have two types of Indication Low and high for Low Indication we use NAND Gates and for high Indication we use AND Gate.

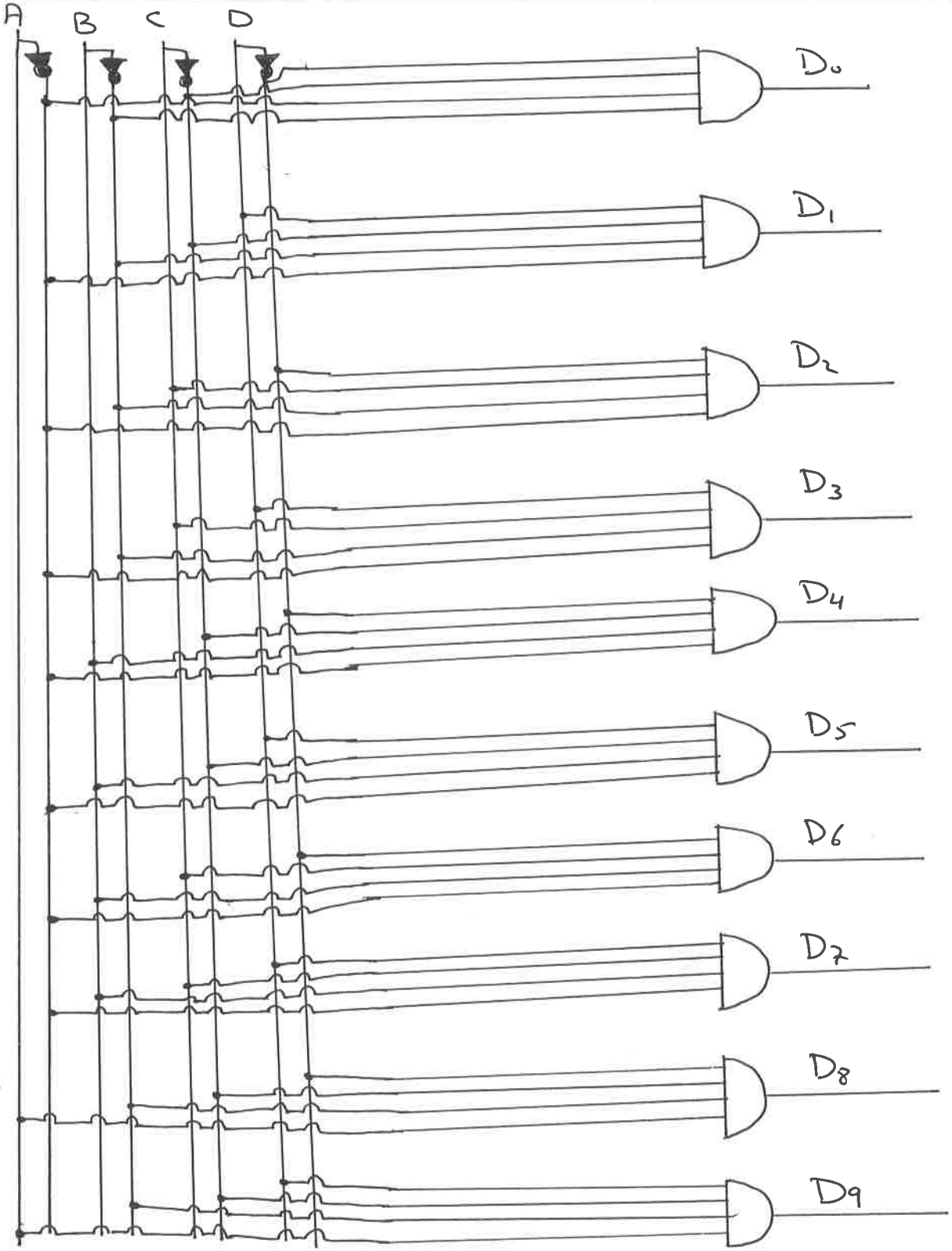
Ex) shown how you can Indicate the number of $10)_{10}$ for high or Low ?

Sol~)



BCD Decoder :o

The BCD decoder converts each BCD code (8421) into one of the possible decimal digit Indication it is refered to as a-1-of-10 or 4-Line-to-10-line decoder.



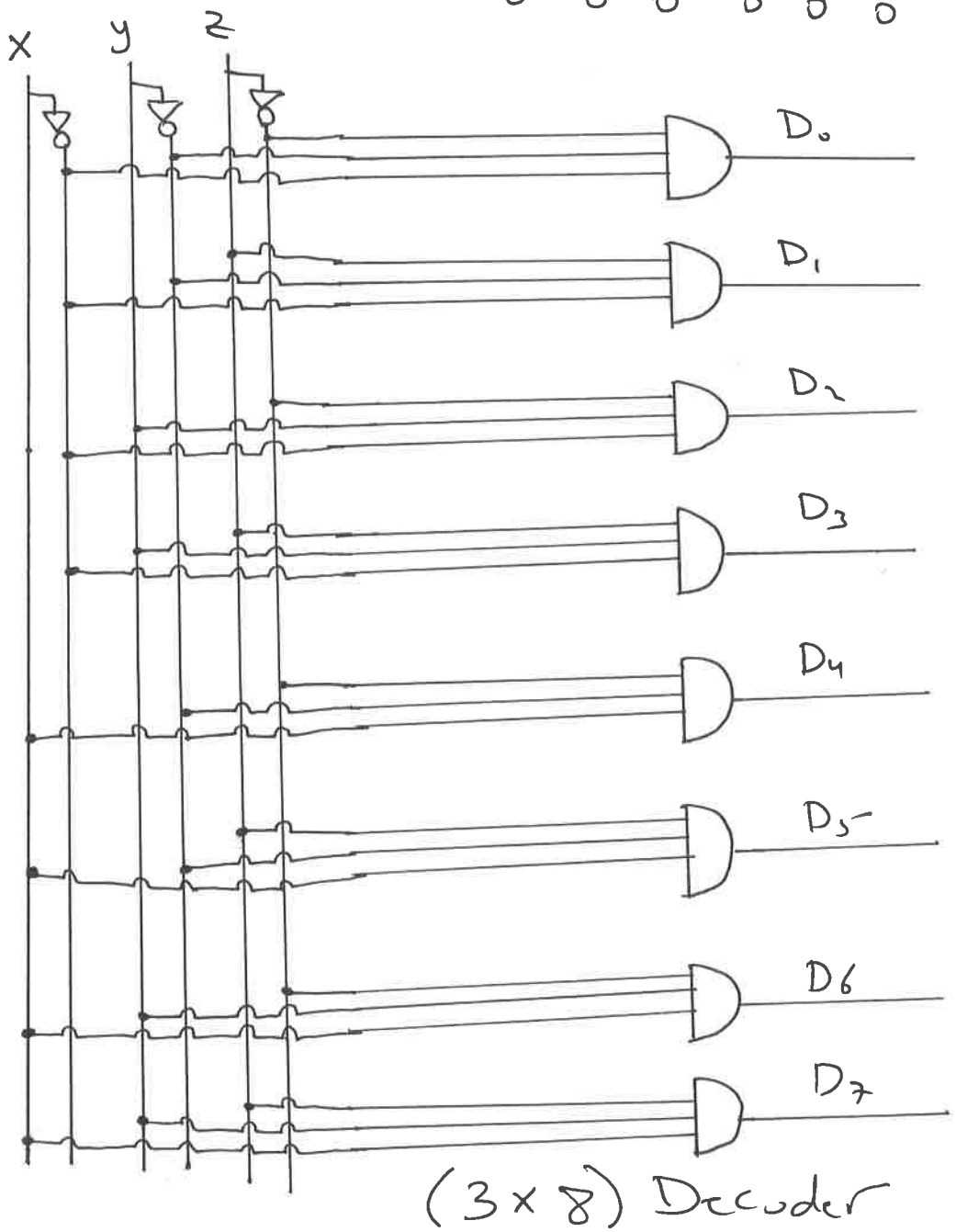
(4x10) Decoder

Ex) Design (3x8) Decoder?

Sol)

x	y	z
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

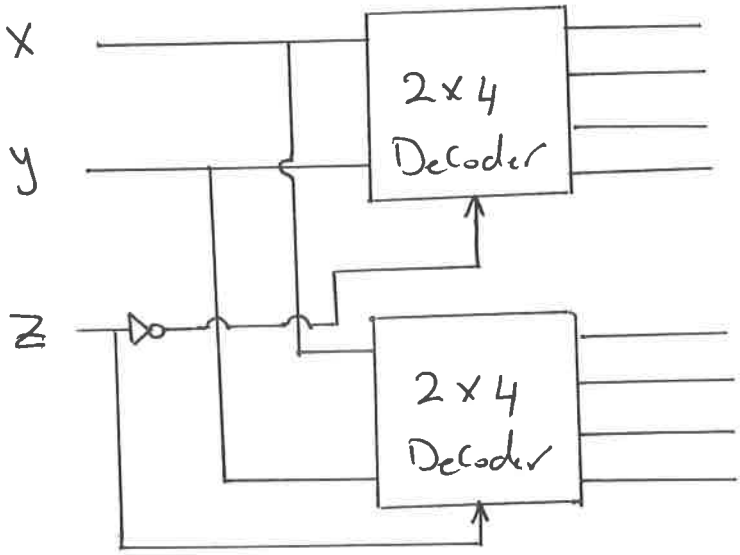
D_0	D_1	D_2	D_3	D_4	D_5	D_6	D_7
1	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0
0	0	1	0	0	0	0	0
0	0	0	1	0	0	0	0
0	0	0	0	1	0	0	0
0	0	0	0	0	1	0	0
0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	1



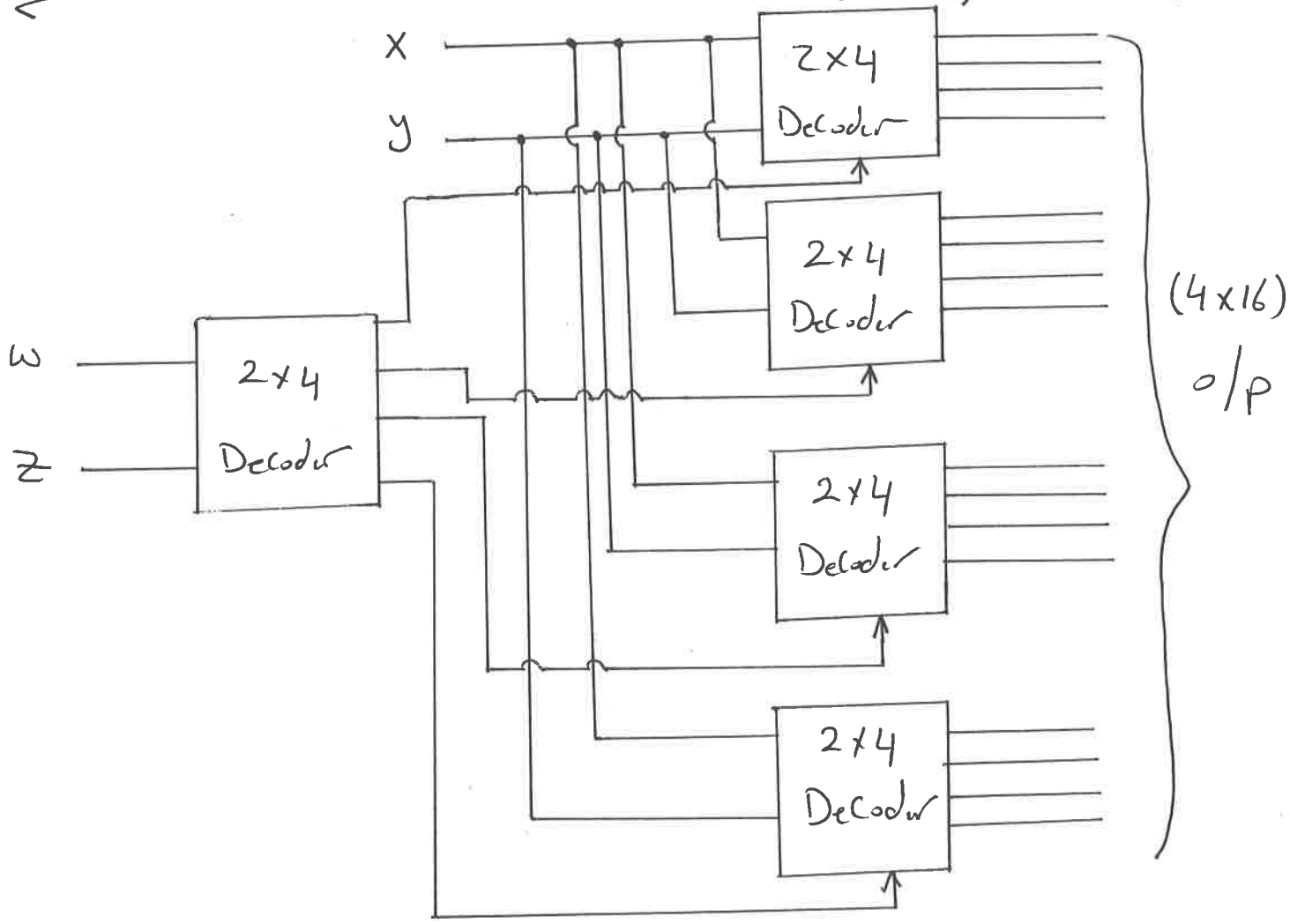
(3x8) Decoder

Ex) Design a BCD code to Decimal Decoder? \ H.W

Ex) Constructed a (3x8) Decoder from (2x4) Decoder?



Ex) Construct (4x16) Decoder from (2x4) Decoder?



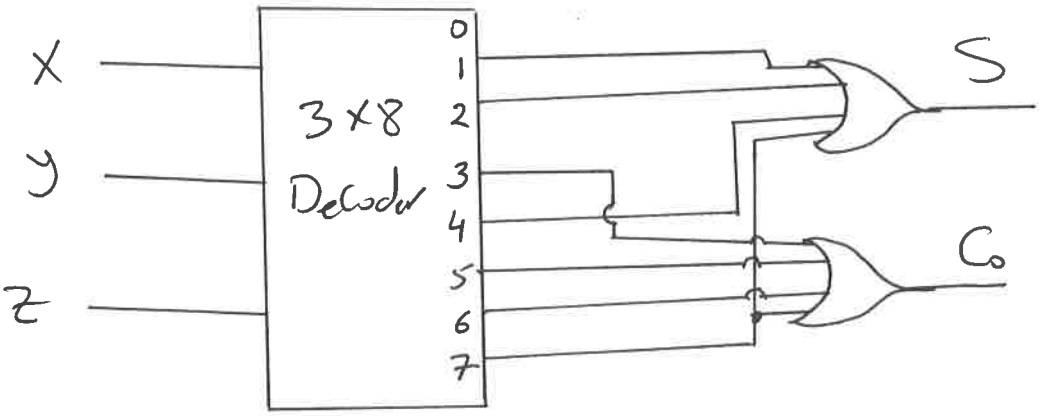
Ex) Implement F.A circuit with Decoder and 2 OR gates?

Sol)

X	y	z	S	C_o
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$S = \Sigma 1, 2, 4, 7$

$C_o = \Sigma 3, 5, 6, 7$



Ex) Design a BCD to Ex-3 Converter using BCD to decimal decoder and Four OR gates?

Sol)

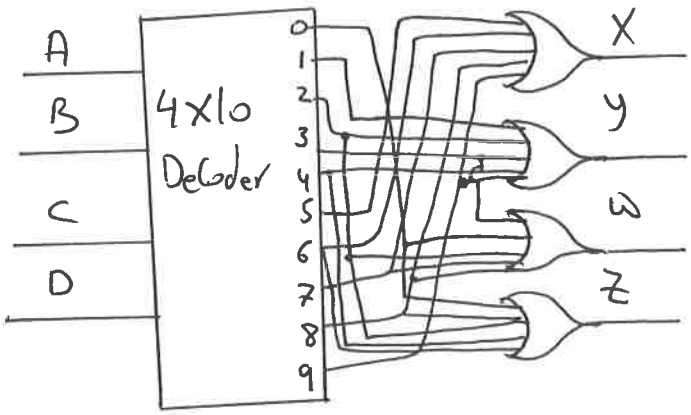
BCD A	B	C	D	Ex-3 X	y	W	Z
0	0	0	0	0	0	1	1
0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	1
0	0	1	1	0	1	1	0
0	1	0	0	0	1	1	1
0	1	0	1	1	0	0	0
0	1	1	0	1	0	0	1
0	1	1	1	1	0	1	0
1	0	0	0	1	0	1	1
1	0	0	1	1	1	0	0

$X = \Sigma 5, 6, 7, 8, 9$

$y = \Sigma 1, 2, 3, 4, 9$

$W = \Sigma 0, 3, 4, 7, 8$

$Z = \Sigma 0, 2, 4, 6, 8$

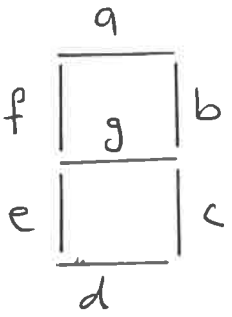


BCD-to-Seven Segments Display :-

This type of Decoder accepts the BCD code on its input and provide output to energize 7-Segments display in order to produce a digital read out.

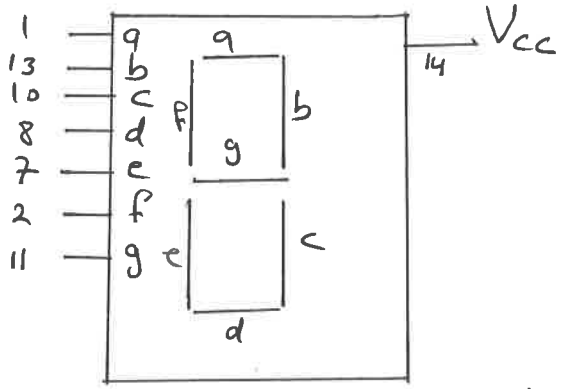
LED

(Light Emitting Diode)

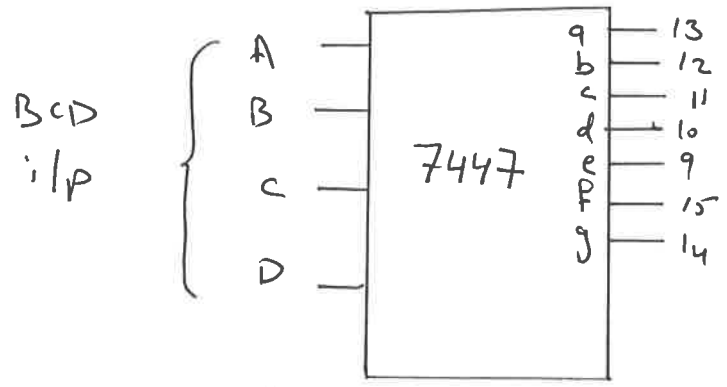


Digit	Segment illumination
0	a, b, c, d, e, f
1	f, e or (b, c)
2	a, b, g, e, d
3	a, b, c, d, g
4	f, g, b, c
5	a, f, g, c, d
6	a, f, g, e, d, c
7	a, b, c
8	a, b, c, d, e, f, g
9	a, b, c, d, f, g

The IC (Integrated circuit) 7730 shows this type of Decoder



((BCD-to-7-Segment Display Decoder))



(7-Segment Display)

There are many midwam MSI (midwam Scale Integration). There are a number of MSI units aVariables to convert BCD code into digit out one of them (7447) Ic.

Ex) Design a BCD to 7-Segment display Decoder.?

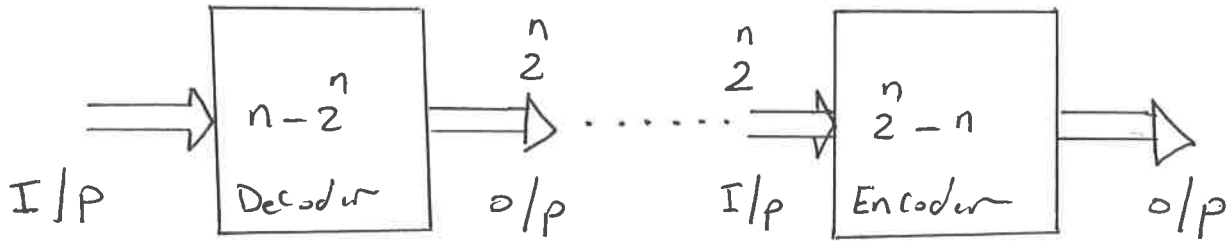
Sol)

	i/p A	B	C	D	o/p a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	0	0	0	1	1	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	1	0	1	1

$a = \Sigma 0, 2, 3, 5, 6, 7, 8, 9$
$b = \Sigma 0, 1, 2, 3, 4, 7, 8, 9$
$c = \Sigma 0, 1, 3, 4, 5, 6, 7, 8, 9$
$d = \Sigma 0, 2, 3, 5, 6, 8, 9$
$e = \Sigma 0, 1, 2, 6, 8$
$f = \Sigma 0, 1, 4, 5, 6, 8, 9$
$g = \Sigma 2, 3, 4, 5, 6, 8, 9$
(Don't care) $X = \Sigma 10, 11, 12, 13, 14, 15$

$\Rightarrow$ continon (H.W)

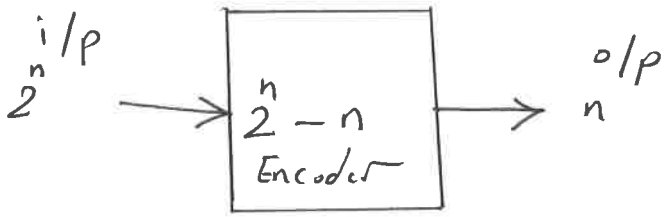
Decoder and Encoder:-



Encoder:-

An encoder is a digital circuit that performs the inverse operation of a decoder. An encoder has 2^n (or fewer) inputs lines and n output lines.

It is the Reverse of the decoder



Ex) Design (4-2) line Encoder ?

I/p				o/p	
X_1	X_2	X_3	X_4	A	B
1	0	0	0	0	0
0	1	0	0	0	1
0	0	1	0	1	0
0	0	0	1	1	1

$$A = (\bar{X}_1 \bar{X}_2 X_3 \bar{X}_4) + (\bar{X}_1 \bar{X}_2 \bar{X}_3 X_4)$$

$$B = (\bar{X}_1 X_2 \bar{X}_3 \bar{X}_4) + (X_1 \bar{X}_2 \bar{X}_3 \bar{X}_4)$$